DOCUMENT RESUME

ED 185 634 CS 502 908

AUTHOR Wiseman, Richard I.
TITLE Functional Systems and Culturally-Determined Cognitive Differences.
PUB DATE Feb 80
NOTE 22p.; Paper presented at the Annual Meeting of the Western Speech Communication Association (Portland, OR, February 16-20, 1980).

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Behavior Patterns; *Cognitive Processes; *Cognitive Style; *Communication (Thought Transfer); Cross Cultural Studies; *Cultural Differences; Learning Modalities; *Perception; Research Needs; Social Influences; Theories
IDENTIFIERS *Cross Cultural Communication; *Luria (Alexander)

ABSTRACT

Noting that one means of better understanding the nature of cultural differences is to elucidate the cognitive differences between members of differing cultures, this paper examines Alexander Luria's sociohistorical theory of functional cognitive systems. The paper first describes Luria's notion of functional systems, the crux of which postulates an interdependent, processual relationship between cognition and social interaction. It next integrates this notion with current empirical research on perception. Finally, it presents implications for future research on cross-cultural communication based on this theoretical and empirical work. (FL)

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FUNCTIONAL SYSTEMS AND CULTURALLY-DETERMINED COGNITIVE DIFFERENCES

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by

Richard L. Wiseman

California State University, Fullerton

Paper presented to the Intercultural Interest Group of the Western Speech Communication Association, February 19, 1980.

CS502908

FUNCTIONAL SYSTEMS AND CULTURALLY-DETERMINED COGNITIVE DIFFERENCES

One means of understanding better the nature of cultural differences is to elucidate the cognitive differences between members of differing cultures. If cognitive processes are cross-culturally different, yet intraculturally similar, then hopefully we can isolate the differential effect of cognitive processes on behavior, be that behavior social, political, economic, etc.[1] Two general paradigms can be distinguished within this approach: the more conventional view that cultural differences in cognition are composed largely of differences in the existence or amount of some hypothetical psychological capacity (e.g., abstract thinking) and the view that such differences reside in the way particular processes are brought to bear on the problem at hand (e.g., use of null logic vs. nominal logic).[2]

Of the two paradigms, the former -- treating cognitive processes as entities -- has been the predominant paradigm. Herbert Spencer (1888) echoed the Zeitgeist of Darwinism when he posited that all things -- organic, inorganic, superorganic -- evolve from simpler

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[1] Brodbeck (1975) would consider this line of reasoning "reduction proper", i.e., reduction of more macroscopic explanations (e.g., political, social) to more microscopic explanations (e.g., cognitive). She cautions that macro-theory must be derivable from micro-theory. A point we should all remember.

[2] Stewart (1976) makes a similar distinction when discussing differences in the foci of experimental designs: attribute or trait vs. process. In the former, the design attempts to isolate measurable differences in a given trait and then discern differences in behaviors manifest as a function of that trait. In the latter, the focus is upon differences in the processes, operations, or functions of the variable.

to more complex forms. Spencer further contended that human organizations (e.g., culture, society) also obey this law. In fact he stated (1888, p. 90) that "development of higher intellectual faculties has gone on pari passu with social advance alike as cause and consequence." More recently, Werner (1957) suggested that differences within and between cultures could be accounted for on the basis of level of development. This process was delineated as Werner's orthogenetic principle -- that whenever development occurs, it proceeds from a state of relative lack of differentiation to a state of increasing differentiation, articulation, and hierarchic integration (Werner and Kaplan, 1956). Given these (and similar) contributions to a general theoretical framework, a voluminous amount of empirical research has been inspired to discern deficiencies in the development of cognitive processes in various cultures. In essence, an extrapolation of this Zeitgeist might be "what is it that you don't have that we do (and vice versa)."

Juxtaposed to this paradigm is one advocated by Cole and Scribner (1974), that of conceptualizing cognition as processes or operations. According to Cole and Scribner (1974, p. 191), the cognition-as-entity paradigm leads to "unresolvable ambiguities and paradoxes in the interpretation of experimental data and their integration with the research findings of anthropologists." By conceptualizing cognition as process, the new paradigm frees the researcher from finding (fabricating via artifacts in diagnostic tests?) supposed differences in cognitive structures. These authors suggest that "we are unlikely to find cultural differences in the basic component cognitive processes" (p. 193).

Cole and Scribner trace the origins of this new paradigm to L. S. Vygotsky and his student, A. R. Luria. Specifically, Cole and Scribner utilize Vygotsky and Luria's notion of "functional systems" in attempting to explain cognitive differences between cultures. The crux of this notion is that "higher mental functions are complex, organized functional systems, the components of which are represented in different areas of the brain and combined in different constellations depending on the task at hand" (Cole and Scribner, 1974, p. 192).

The purpose of the remainder of the present paper is threefold. First, an attempt will be made to elucidate further Luria's notion of functional systems to better understand the nature of culturally-determined cognitive differences. Second, an attempt will be made to integrate current empirical research on perception with Luria's notion of functional systems. Lastly, implications based upon this theoretical and empirical work will be described for future research on cross-cultural communication.

Luria's Notion of Functional Systems

Luria tried to take account of both the general, unchanging aspects of cognitive processes and their specific, historically changing aspects by making a distinction between two connotations of the term "function." The unchanging aspects of cognition are explained by elementary psychophysical functions such as "sensation, movement, elementary forms of attentions and memory [which] are undoubtedly natural functions of the nervous tissue" (Luria, 1971, p. 260). The specific, historically changing aspects of cognitive processes are explained by the second connotation of function, i.e.,

the "higher psychological functions (voluntary movement, active attention, abstract thought, and voluntary movement) [which] cannot be understood as a direct function of the brain" (Luria, 1971, p. 260). Luria defines these higher mental functions as "complex reflex processes [that are] social in origin, mediate in structure, and conscious and voluntary in mode of function" (1966a, p. 32). After providing an example of a functional system, we will discuss this definition more fully.

An example of a functional system might be object perception. Morphologically, visual perception not only includes the reflection of the visual image on the retina, but also the active exploratory movements of the eyes. In fact, Yarbuss (1956) found that if the image of an object falls on a single, immobile point of the retina, it ceases to be perceived after two or three seconds and that more lasting visual perception of an object demands a change on the retina, which is carried out by means of micro- and macroscopic movements of the eyes. Even on this level we have processes analyzing and synthesizing extero- and proprioceptive information (i.e., the image of the object on the retina and the cues from eye movements, e.g., depth, direction, movement), but even more analyzers are involved in perception. According to Bruner (1957), perception begins as complex, active processes, based on consecutive examination of the individual details of an object and the recognition of points having the greatest information, the deduction of incorrect hypotheses and the obtaining of some form of synthesis of the most informative cues, from which the meaning of the perceived object may be concluded. As one can see, a complex system of afferent and motor processes are involved in one functional system. What might not be as obvious from the above dis-

cussion is that each of these processes may be interconnected with other processes to form other functional systems (e.g., depth perception and similar proprioceptive cues are instrumental in the function of locomotion).

Given the definition and example of a functional system, we can now discuss one of the definitional characteristics of functional systems, i.e., their social genesis. In contrast to other animals, human behavior is not only based upon inborn tendancies and direct experience, but also a third factor: "the assimilation of the experience of mankind in general . . . is incorporated in objective activity, in language, in the products of work, and in the forms of social life of human beings" (Luria, 1966b, pp. 21-22). Through one's social interaction, an individual learns to recognize and adapt to culturally-salient features of one's environment (Luria, 1976a). Thus, the higher cognitive processes of human beings are organized into functional systems, which arise in the course of socially determined activities and change with the nature of these activities.

Because the social transmission of culturally-relevant knowledge is symbolic in nature, the social genesis of functional systems enables the second characteristic of functional systems, i.e., their mediate structure. Through social interaction, the individual learns to construct the symbolic rules of relationship between one's goals and alternative cognitive processes. Perhaps we can better understand the characteristic of mediation by examining the ontogenetic development of higher mental functions. The child's mental development itself is based on functional systems and the interdependence of individual forms of mental processes in different

stages of development becomes highly distinctive. In the earlier stages of development the main direction of dependence of psychological functions is from bottom to top, i.e., relatively more simple and primary mental processes are the basis for the development of more complex processes. An analogy of this process can be extrapolated from Hirsch and Spinelli's (1970) research on the effects of early visual experience on receptive field organization of kittens. The authors gave differential exposure to the eyes of kittens. One eye was permitted to see only horizontal bars and the other eye only vertical bars. As a result of this treatment, it was found that all cortical units responsive to bars responded only to input from only one of the two eyes (suggesting separate visual fields) and the neurons responsive to vertical bars were stimulable only through the eye that had been exposed to vertical bars and similarly for horizontal bars. In summary, the "tabula rasa" develops functional systems that best accommodate to the world as depicted by sensorimotor information. In the later stages of development, and especially in adult behavior, the dependence is from top to bottom, i.e., "reconstruction of all functions, even elementary ones, by means of speech and of the second signal system [i.e., the verbal system] formed on the basis of speech" (Luria, 1966b, p. 59). In terms of our object-perception example mentioned above, once we have learned the symbolic connections between objects, activities, and intentions, our perception is then directed to experientially-salient cues in our environment.

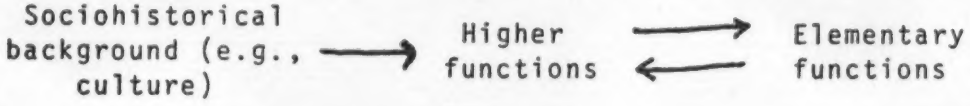
The mediate structure of mental functions gives rise to the third characteristic of mental functions, i.e., their conscious and voluntary mode of functioning. Through our communication with others

and our incorporation of the symbolic rules of relationship between elements in our environment, our mental functions become voluntary, that is, "they become conscious and controllable by the will. Perception becomes categorical, thinking becomes conceptual, attention becomes voluntary, etc." (Bozhovich, 1977, p. 10). For Luria, our intentions -- which are themselves social in origin -- are the conscious bases for our behavior (cf. 1976a, p. 8ff.). Given some culturally-valued goal or intention, the individual selects or constructs a functional system instrumental in obtaining the goal. Although a potentially infinite number of function systems could be generated, Luria (1973) believed that they all involved the coordination of three functional units: one unit regulating the activity level of the individual; another unit for receiving, analyzing, and storing information; and the last functional unit for the programming, regulation, and verification of activity. Consistent with Luria's sociohistorical perspective, the coordination of these three functional units for the purpose of obtaining some goal is learned through our communication with others. That is, through our social experience we learn what to attend to, how to perceive it, and what action to take on it.

Some Relevant Empirical Research

With the above consideration of Luria's work serving as our theoretical framework, we can now integrate some of the empirical research on perception, especially Carr and Francke's (1976) study of culture's impact on the development of vision and Fre·des' (1974) near-exhaustive, 184-study review of the literature on human information processing and sensory modality.

The underlying thesis of Carr and Francke's study of perception in Chinese and American cultures was that "a society's culture, as reflected in its child rearing practices, educational methods, houses, furniture, and ways of thinking and behaving, affects the visual physiology of its members" (1976, p. 15). As with Luria, the authors believe that vision (i.e., an elementary function) is intricately involved with the whole body system, its present functioning and past experience. The authors echo Luria's notion of complex functional systems when they said that "the eyes, other sense organs, musculature, and neurological processes all work together to form space-time concepts that enable the individual to locate and identify objects and events in the physical world" (1976, p. 18). In essence, Carr and Francke have hypothesized the very spirit of Luria's theoretical argument:



To test this hypothesis, Carr and Francke selected samples from two supposedly divergent cultures -- Chinese and American. Based on several ecological (e.g., structure of home), educational (e.g., rote memorization as a tool in education), social (e.g., to keep to yourself and respect others' property), biological (e.g., the slump in one's posture due to child-rearing), and philosophical (e.g., life of reflection instead of experimentation) factors, Carr and Francke predicted that the Chinese sample would pay more attention to their immediate surroundings -- inwardizing -- than the American sample. An inwardizer would tend to handle objects and events best when they are immediately present and would

have difficulty projecting relationships into distant space and time. To test this, the authors administered a battery of twenty-one optometric tests to the two samples. Carr and Francke summarize their findings[3] by saying:

> We noted these visual characteristics of Chinese subjects: they ignored or degraded distant targets; they centered their eyes on a point closer to themselves than did American subjects; when looking at a distant target, they focused on a point significantly short of the target: they had a range of control of space for distant and near targets that was greater inward from these targets than the Americans; they centered their bodies toward a point short of the visual target to a greater degree than did the Americans. (1976, p. 40)

Although it would be near-impossible to isolate the causal link, the evidence from Carr and Francke's study suggests that culture, as reflected in ecology, child-rearing, social relations, biological conditions, and philosophical beliefs, has an impact on vision. In Luria's terminology, the subjects had developed complex functional systems which accommodated the social and physical environment for optimal adaptation. These higher mental functions then directed elementary mental functions (e.g., vision) in their effort to discern the experientially-salient information in the objective world.

The focus of Freides' (1974) review of the literature was on the controversy between psychologists as to whether information

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[3]One must be cautious in generalizing from the results because the study has design problems such as the size and selection of the sample.

processing was modal specific -- "each modality has distinct patterns of transduction, specific sites of neural transmission and processing, and unique sensory and perceptual qualities" (p. 284) -- or nonmodal -- "the specific qualities of each modality are disregarded and a single mode of information processing is assumed" (p. 284). After reviewing a vast amount of relevant literature, Freides concluded that "information capacity" is the unifying variable between the two extremes: the modal-specific position is consistent in interpreting data regarding complex information processing, whereas the nonmodal position is consistent with the data on simpler information loads. When information reaches a modality that is not adept at translating it (e.g., discerning the shape of a complex object via touch), then that information is translated to the most adept modality (e.g., visualizing the object on the basis of haptic information) (Pick, 1970). This process implies that the development of cross-modal functions consists of learning to perform the translation.

The question now arises: Is the cross-modal translation innate or learned? Goodnow (1971), in her study of memory and sensory modalities, found that there was a great deal of plasticity in the information-handling capabilities of all senses, suggesting that experience, rather than inborn programming, might decide how information eventually will be handled. In fact, one of Freides' conclusions was:

> Experience (empiricism) then should be crucial to the development of cross-modal functions. It is not a matter of one modality teaching another, as in classical empiricism, but learning to translate selected

> classes of information into the modality of greatest adeptness. Because receptor orientation and motor functions appear to play an important role in these developments, data and theory on the development of sensory motor competence may be relevant (1974, p. 302, emphasis added).

This last point is especially important in Luria's sociohistorical analysis. We see that modality adeptness is developed through experience: ecological, social, parental, and, in general, cultural. Then, as the functional systems become developed, cross-modal transfers are easily accomplished via functions/translations within the functional system (e.g., "receptor orientation" and "motor functions").

Implications for Communication Research

Perhaps a proper transition into this section, which considers the research implications, would be to cite what Freides believes is one of the major implications of his review for understanding cultural differences:

> . . . when a child is instructed to take the time to think, when he hears verbal explanations, and when his own verbal output receives serious consideration, selective reinforcement of both the use of the auditory modality and a differentiating cognitive style are occurring. This might explain why Rudnick et al. (1972) and Bryden (1972), with impoverished children and poor readers, found auditory-temporal performance to be very poor, whereas Klapper and Birch (1971) and Goldstone and Goldfarb (1966), with middle-class children, found auditory-temporal skills to develop earlier and be more advanced than visual-temporal skills (1974, p. 303).

Functional systems develop as a product of interaction with one's

social environment, then those functional systems determine what information one attends to, how that information is perceived, and what action will be taken on that information. The remainder of this section will consider the implications for research these two relationships between communication and functional systems -- communication as a cause and an effect of functional cognitive systems -- and then conclude with a metatheoretical appeal for process as a focus in communication research.

Our communication with others in our culture has two main influences on the functional cognitive systems we subsequently develop. First, our interaction with others of our culture is the source of many of the generative mechanisms for our behavior. Luria emphasizes this notion:

> Any movement is aimed at a certain goal and carries out a certain motor task. At the level of instinctive behavior, with its elementary structure, these motor tasks are dictated by inborn programmes; at the level of a complex conscious action formed during life, they are dictated by intentions which are formed with the close participation of speech, regulating human behavior (1973, p. 37).

Our culture generates tasks or motives for our behavior. Several interpersonal communication scholars (e.g., Cushman and Whiting, 1972) and intercultural communication scholars (e.g., Casmir, 1978; Wiseman, 1978) have recognized the importance culture plays as a generative mechanism for our behavior. Given the motivational character of this cultural influence, much of the research regarding cultural differences in value orientations is relevant at this point (e.g., Kluckhohn and Strodtbeck, 1961). Albert clarifies the relationship between values and behaviors when she states that

a "value system . . . represents what is expected or hoped for, required or forbidden. It is not a report of actual conduct but is the system of criteria by which conduct is judged and sanctions applied" (1968, p. 288). Programmatically, the communication researcher would need to identify those cultural value orientations that generate prevalent and recurring tasks obligating, prohibiting, or permitting particular behavioral sequences.

Besides culture's influence on one's intentionality, culture also influences the particular configuration of the functional cognitive system instrumental in obtaining some intention. Luria points to the sociohistorical development of functional cognitive systems when he states:

> The way in which the historically established forms of human mental life correlate with reality has come to depend more and more on complex social practices. The tools that human beings in society use to manipulate that environment, as well as the products of previous generations help shape the mind of the growing child, also affect these mental forms. In his development, the child's first social relations and his first exposure to a linguistic system (of special significance) determine the forms of mental activity. All these environmental factors are decisive for the sociohistorical development of consciousness. New motives for action appear under extremely complex patterns of social practices. Thus are created new problems, new modes of behavior, new methods of taking in information, and new systems of reflecting reality (1976b, p. 9).

Culture not only provides us with motivations for our behavior, but also delineates behaviors and/or cognitive processes instrumental in obtaining culturally-valued goals. Cultural differences in the functionality of communication behaviors instrumental to a cultural task can be exemplified in regards to the task of "verbal dueling":

seventeenth-century Puritans prohibited sexual and scatalogical communication content, American blacks obligate sexual and scatalogical content (Mitchell-Kerman, 1972), and young Turkish males obligate a rhythmic structure (Dundes et al., 1972). For the communication scholar, the research task would entail the identification of those cognitive and behavioral processes that were instrumental in obtaining culturally-valued goals.

The sociohistorical approach not only predicts communication's effect on functional cognitive systems, it also predicts the cognitive system's effect on our communication with others. Once we induce the appropriate functional systems from our interaction with others, we can then use these functional cognitive systems to encode and decode our communication. Cole and Scribner emphasize cognition's role in communication:

> Successful formulation of a message was seen to require the speaker to perceive differences among the [stimuli], to attend to distinctive, distinguishing features of the stimuli, to assign appropriate descriptive terms from his vocabulary, to remember descriptions, and to understand the task at hand. Virtually every area of cognition described in this book plays some part in successful communication performance (1974, pp. 191-192).

Each of these cognitive processes is essential for communication with others, and a failure in any one of these processes can yield poor performance.

In his seminal article, "Outline of Intercultural Communication," Edward Stewart (1978) attempts to integrate cognitive processes and communication performance via a competence model which is very similar to Luria's notion of functional cognitive systems. For Stewart, this competence model "identifies the core

of competence in communication as processes and structures in the brain, the mental representation of communicative perceptions and behavior" (1978, pp. 274-275). For both Stewart and Luria, these cognitive processes are social in origin and act to mediate our communication behavior. A question now confronts the communication scholar: How can we best characterize these cognitive processes?

As mentioned before, Luria believed that every functional cognitive system involved the coordination of three functional units: one unit regulating the attention level of the individual; another unit for receiving, analyzing, and storing information; and the last functional unit for the programming, regulation, and verification of activity. In this sense, a functional cognitive system would identify those communicative stimuli that we should attend to, how we should perceive the stimuli, and what action we should take on it. A similar model has recently been proposed by two communication scholars, Cushman and Craig (1976), in their analysis of interpersonal communication competence. Cushman and Craig suggest that competence rests on the degree to which an individual develops and is able to manifest three types of communication skills -- listening, cueing, and negotiation:

> Listening skills turn on our ability to recognize differing types of statements and the respective self-object relationships which they designate. Cueing skills turn on our ability to translate our own relationships to objects into the vocabularies of diverse others. Negotiation skills turn on our ability to recognize the position of others, to cue others as to our position, and to develop the appropriate strategies for reconciling the differences in our expectations toward situations (1976, p. 55).

Programmatically, the communication scholar would need to identify

how these three functional units/skills are coordinated in the communication situation. In the intercultural context, the communication task is more problematic since divergent functional cognitive systems, and their corresponding organizations of functional units, need to be coordinated. The communication scholar can help ameliorate this coordination problem by either identifying ways in which one of the communicators can adapt to the other's cognitive system or depicting ways in which the two cognitive systems can be synthesized to create a common functional system. The research on the culture assimilators illustrates one means of helping intercultural communicators adapt to the functional cognitive systems evidenced in other cultures (Fiedler, Mitchell, and Triandis, 1971).

At the beginning of this paper I made a distinction between two ways of viewing cognition -- from an attribute or trait perspective vs. a process or functional perspective -- and made an appeal for viewing cognition as process. I would like to reiterate that appeal in this conclusion. Several intercultural communication scholars have pointed to the inseparable, processual nature of communication, cognition, and culture (e.g., Stewart, 1974; Powers, 1979). Saral depicts the implications of the process view of intercultural communication:

> Rather than occupying ourselves with the surface structure of cultural features such as attitudes, norms, values, role perceptions, and language, we will begin to focus upon the deep structure of cultural experience characterized by the reception, organization, and utilization of information gained through contact with environment (1979, p. 82).

Luria's notion of functional cognitive systems, especially with its sociohistorical character, can facilitate our progress toward depicting the processual nature of communication, cognition, and culture. In so doing, we can come to a better understanding of the interrelationships among these processes.

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